MCZ newsletter
MUSEUM OF COMPARATIVE ZOOLOGY

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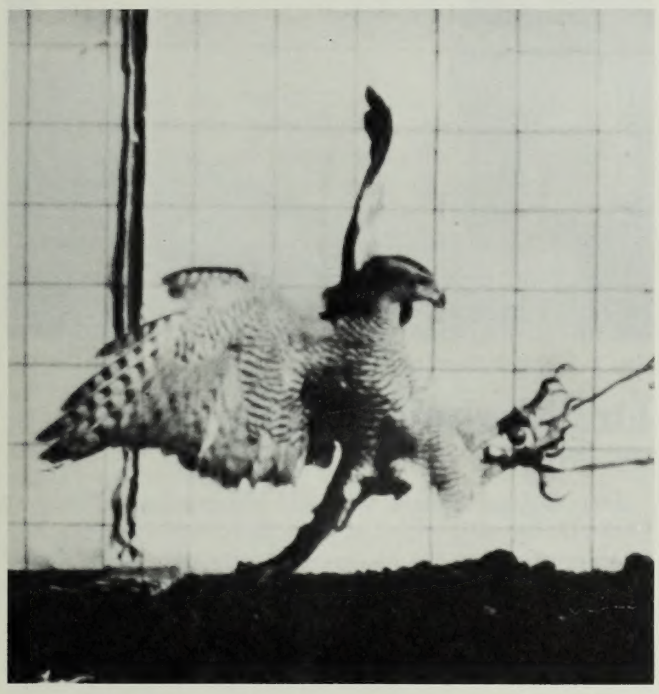
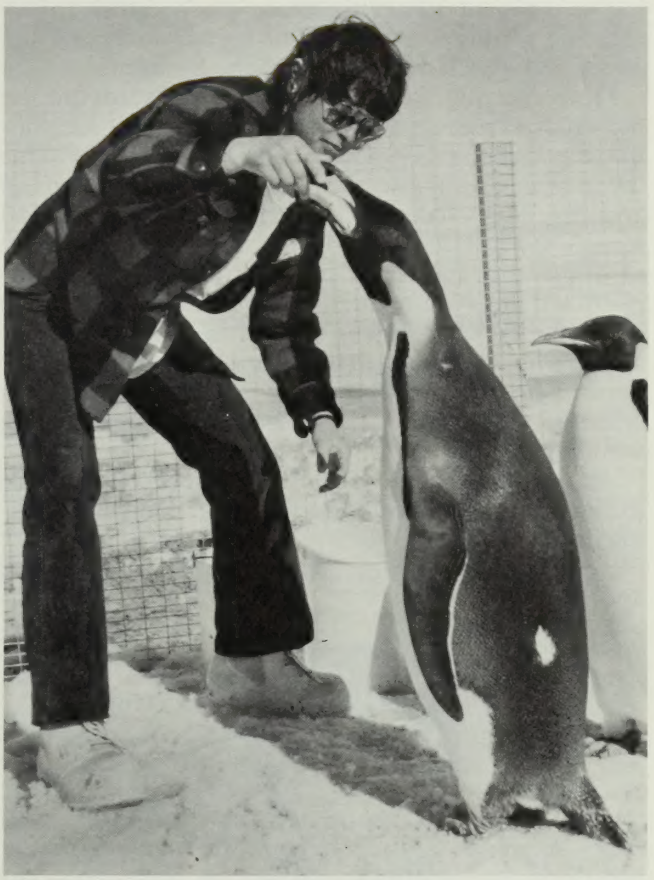
TWO ILLUSTRATED BIRD TALKS IN DECEMBER



A goshawk about to capture its prey. The grid in the background provides a scale. Photo by Ted Goslow

The Prey-Capture Behavior of some North American Birds of Prey.

On Tuesday, December 6, Dr. G. E. (Ted) Goslow, Jr. will show the product of his research on the physical adaptation of prey-catching in hawks, falcons, and owls—a remarkable high-speed film which slows down the action to the point where each bird's complex movements can be seen and understood.



Researcher Hanna Pinshow feeding penguins at the McMurdo Research Station. Photo by Katherine Muzik

The Long Winter of the Emperor Penguin

On Tuesday, December 13, Dr. Michael Fedak will present a slide talk on his research in the Antarctic on the uncanny endurance of the emperor penguin. How these birds manage to not only survive the extreme conditions of the polar winter but even incubate their eggs at the same time was the intriguing question Dr. Fedak and his colleagues set out to answer in the winter of 1973-4.

Both talks are at 5:30 in the Geological Lecture Hall, 24 Oxford Street, Cambridge
Admission: Friends of the MCZ: Free; Others: $1.00
Refreshments for Friends and their guests following the talks.

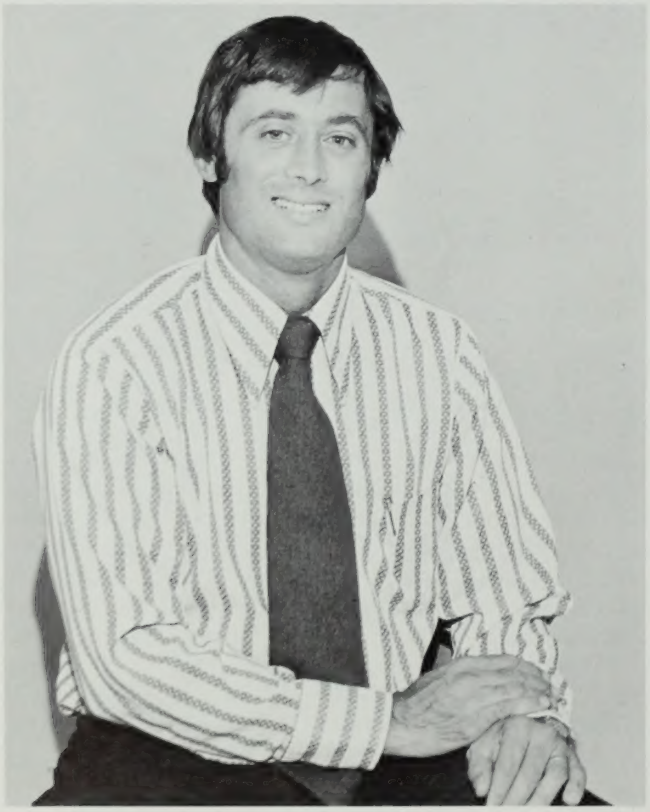
ABOUT THE SPEAKERS

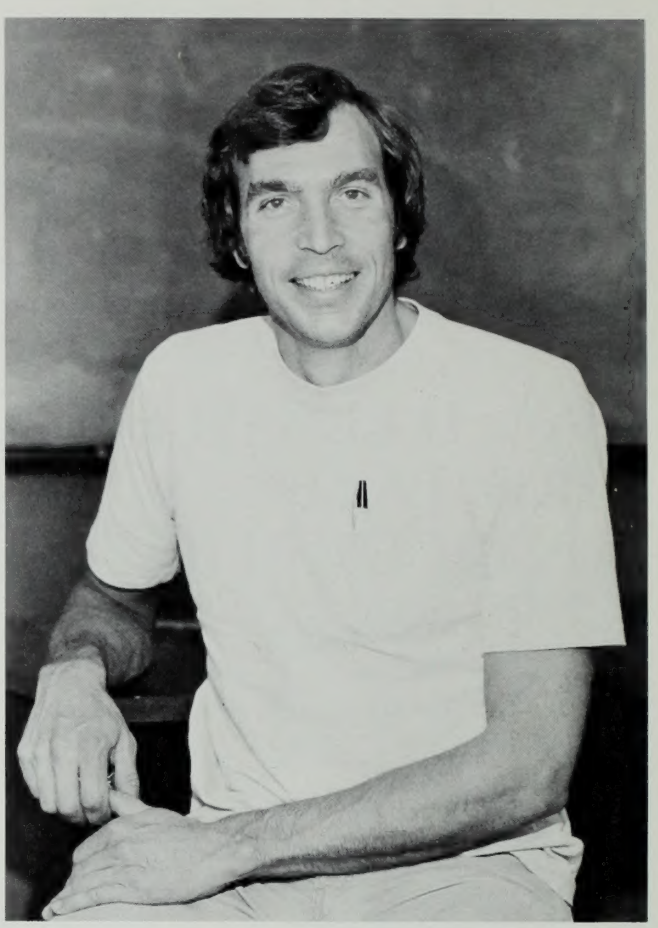
Dr. Ted Goslow

Dr. Ted Goslow, Associate Professor of Biology at Northern Arizona University (Flagstaff), is currently spending his sabbatical year at the MCZ. His interest in vertebrate locomotion was acquired during his graduate study with Dr. Milton Hildebrand at the University of California (Davis). His Ph.D. thesis work ("adaptation of hindlimb structure for grasping in North American birds of prey") involved the challenging exercise of recording these birds during prey-catching on high speed film and then analyzing the strike and attack movements frame by frame.

More recently Dr. Goslow has been studying the muscular systems used during posture and locomotion through the technique of electromyography. This involves inserting a wire into the appropriate muscle and attaching it to a device which records the electrical signals the muscle emits during contraction. In order to allow the animal (usually a cat or skunk) unrestricted movement, Dr. Goslow utilizes telemetry to send the signal from the animal to the recorder. A small radio is attached to the animal which is then able to run free, unencumbered by wires. This technique is effective when only one or two muscles are being studied.

At the MCZ, Dr. Goslow plans to expand his locomotion studies to a variety of other animals including lizards and dogs. He will also teach in Biology 139: Functional Morphology, with Professors Crompton and Liem.





Dr. Michael Fedak

Dr. Michael Fedak, who did his graduate study at Duke University with Dr. Knut Schmidt-Nielsen, has been continuing his locomotion research at the Concord Field Station. He has run birds (on treadmills) ranging in size from tiny Chinese painted quails to ostriches. The latter have not always been entirely cooperative.

His interest in thermoregulation and physiology in general led him and colleague Berry Pinshow to undertake an ambitious four-month Antarctic research project (funded by the National Science Foundation) four years ago. The object was to discover how the male emperor penguin is able to seemingly thrive and even incubate an egg during winters that are almost impossible for humans (with shelter) to survive. The tractability of these birds as research animals added to the appeal of the project as did the spectacular icescapes. Dr. Fedak still savors the intensity of that arduous winter ("You might be uncomfortable at the time but you don't forget it") and hopes to return to the Antarctic in the not too distant future. Perhaps with a Friends of the MCZ trip?

At present, Dr. Fedak, now Lecturer on Biology, is responsible for the laboratories for Biology 21: Structure and Function of the Vertebrates with Professors Crompton and Taylor, which is now a full-year course.

BOOK REVIEW

ONTOGENY AND PHYLOGENY

by Stephen Jay Gould

Professor of Geology and Curator of Invertebrate Paleontology (*The Belknap Press of the Harvard University Press)*

There is no more potent force in science than ideas. Concepts like evolution and natural selection have led to a complete reorganization of vast areas of human knowledge. Gould's splendid first book deals with the set of ideas evoked by the imagined or real parallel between ontogeny and phylogeny. These ideas were among the most stimulating influences on biology during the last 150 years. The German *Naturphilosophen,* enamoured by the universality of development everywhere in nature, believed that the stages through which the embryo passed during development paralleled the scale of organisms from the lowest to the most perfect. After Darwin had proclaimed the theory of evolution in 1859, Haeckel enthusiastically adopted this idea and proclaimed "the law of recapitulation." Soon an entire generation of embryologists applied the law in their comparative studies. Not without opposition! The famous embryologist K. E. von Baer was opposed to evolution and insisted that the embryological evidence merely showed that development went from general and unspecialized to ever greater specialization. Consequently, the embryos of the higher vertebrates resembled those of the lower vertebrates simply because they lacked specializations that would not develop until the later embryonic stages.

Gould's new book gives a superb survey of this controversy but very much more than that. The concept of recapitulation had great fascination even for non-biologists such as educators and criminologists. Indeed, even Sigmund Freud based, in part, his theory of psychoanalysis on it. Was it a sound foundation? In other words, is the theory valid?

The answer is no. No organism recapitulates the adult stages of its ancestors during its ontogeny. No mammal has an embryonic stage during which it looks exactly like a fish. But von Baer's theory is equally wrong. If the mammalian embryo was merely progressing from general to specialized there would be no reason why it should pass through a gill-arch stage! Yet, both opposing theories had part of the truth. The true answer is that early embryonic stages often correspond more or less to equivalent stages of ancestral species. And this community of embryonic structure quite rightly was considered by Darwin evidence for community of descent. If we are willing to redefine recapitulation in this greatly modified form, we must state that it is almost universal.

Gould is not satisfied merely to analyze the history of recapitulation controversy. He shows that there are all sorts of other relationships between ontogeny and phylogeny. Ontogeny may be accelerated or retarded, additional new characters may be added at intermediate or terminal stages of ontogeny or, in the opposite, characters may sometimes be eliminated. Whatever happens during ontogeny is of decisive selective significance since every stage of the life cycle is exposed to selection. The embryologists, therefore, can make a good case for defining phylogeny as the sequence of ontogenies of all organisms making up a lineage.

Gould has produced an unorthodox volume in the most literal sense of the word, since he comes out squarely against various orthodoxies. One of these is the almost universal idea that recapitulation was an interesting but thoroughly ill-conceived speculation of the last century, that is best forgotten and expurgated from the text books. Instead, Gould shows that since ontogeny is controlled by the genotype as a whole, a recapitulation of ancestral embryonic stages is quite frequent owing to the extreme difficulty of restructuring a well-balanced developmental machinery.

A second unorthodoxy consists in Gould's championing of Bolk's theory of human neotony, based on the putative resemblance of adult humans to juvenile apes. Gould revives Bolk's theory, although on a strictly Darwinian basis, showing that a retardation of human development is an inevitable consequence of the human life history: a prolongation of childhood under conditions of parental care and instruction, accompanied by a continuation of brain growth at embryonic rates. A correlation between life history and developmental rates exists not only in man but in all organisms. Sometimes it is of selective advantage, to speed up development, perhaps even to reproduce already as a larva; sometimes there is a premium on retardation and long continued parental care.

It is quite impossible in these few lines to do justice to a 500-page volume full of the most exciting ideas. Let me simply say that the MCZ can be proud that a member of its staff has produced a distinguished and pioneering work. I predict that it will set the stage for a vigorous revival of a recently rather neglected field for which the time now seems to have come.

Ernst Mayr

Alexander Agassiz Professor *Emeritus* and former Director of the MCZ

THE CONCORD FIELD STATION MOVES TO AFRICA!

How does one measure the speed of a galloping giraffe, zebra, or wildebeest? If one is Professor C. Richard Taylor, one simply takes a group of workers to Kenya, sets up a grid on an enormous dry lake bed, conceals the high-speed movie camera, and makes the animals run through the grid. By analyzing the resulting film, Dr. Taylor, Dr. Howard Seeherman and Norman C. Heglund are able for the first time to provide the accurate top speeds for these and other animals. By measuring the gait, stride frequency, and stride length as a function of speed in free-ranging animals, they are able to test their ideas on the mechanics of locomotion. Another phase of the work involves running various humans and animals, ranging in size from a mongoose to a buffalo, on a treadmill set up at a research facility at the East African Veterinary Research Organization in Muguga.

A fruitful half year of research was made possible by financial assistance from the National Science Foundation, National Geographic, and the Guggenheim Foundation, and technical assistance from a large party of workers both from the United States and Africa.

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Editor: Gabrielle Dundon
Photographers: A. H. Coleman
Paula Chandoha

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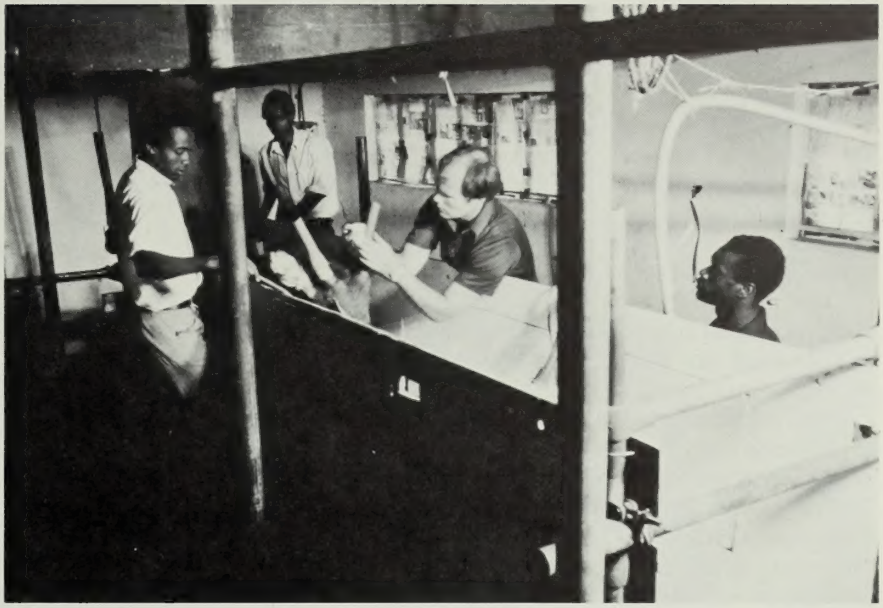

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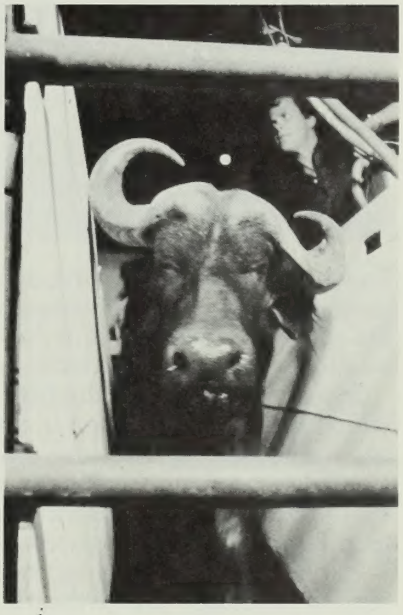

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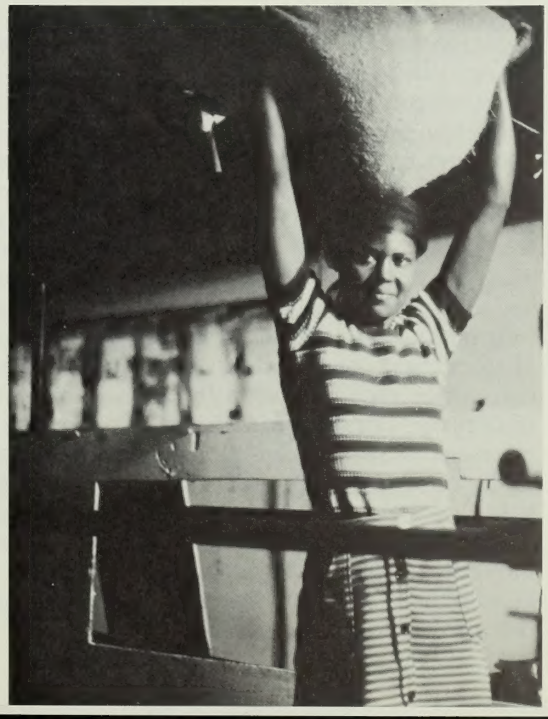
A. The grid is laid out on the lake bed.
B. Norman Heglund scans the horizon, camera and CB radio ready.
C. The animals are camera shy, hence the blind.
D. Trotting zebras (note the camera blind in the background).
E. Galloping giraffes.
F. Rodeo-"African style" is demonstrated by Dr. Taylor and African technicians.
G. The waterbuck, with horn guards in place to prevent ramming, runs on the treadmill. Dr. Taylor and assistants measure oxygen consumption at varying speeds.
H. A fierce buffalo literally eats out of the hands of Dr. Taylor and Deborah Heglund.
I. Next stop, the treadmill.
J. A novel treadmill walker, this Lua woman has a surprisingly low oxygen consumption while carrying an enormous load on her head. American women walked the treadmill too to provide comparative data. (They were far less efficient.) Photos by Norman and Deborah Heglund



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THE CURRENT STATE OF SYSTEMATICS AT THE MCZ

In a frequently quoted 1971 editorial, "The Plight of Taxonomy" (Ecology, Vol. 52, No. 5) Professor E. O. Wilson, Curator of Entomology at the MCZ, lamented the low position to which the systematic study of species had sunk in the hierarchy of biological research areas. As he put it:

> "In the fashion rankings of academic biology, substantive taxonomy long ago settled to the bottom. This must not be permitted to continue. Ecologists, now beginning to savor a windfall of popularity and growing financial support, should recognize their dependence on substantive taxonomy and special responsibility to it. Most of the central problems of ecology can be solved only by reference to details of organic diversity."

How to upgrade systematics and give this indispensable branch of biological study the support it needs and deserves? Dr. Wilson recommended two ways:

> "The first is to give more academic appointments to taxonomists who have mastered the substance, and not just the biometric methodology, of systematics, biologists who are experts on reasonably large groups of organisms on a continental or global aspect . . . The second step is to grant larger amounts of support to the institutions housing the principal systematic collections in this country . . . "

To take the second step first, while Dr. Wilson would certainly not attribute the improvement in the state of the collections systematic at the MCZ to this editorial, he allows that he anticipated the recent upward trend.

Since 1971, three of the MCZ's major collections, which rank among the top in the United States, have been rehoused in renovated quarters thanks to substantial grants from the Systematic Biology Division of the National Science Foundation. They include the fish, herpetology, and entomology collections.

In recognition of the need for improvement in systematic training (Dr. Wilson's first concern) at the MCZ, a search committee is currently attemppting to fill the vacancies in entomology with two full professor/curators and one assistant professor/curator.

The other area of current concern is the Mammal Department. For many years this department has not had a full-time curator and while the collections are in excellent order (thanks to the efforts of Barbara Lawrence, who retired in 1976 after working as Curator on a part-time basis for 35 years) they are badly in need of rehousing. In order to help with the ordering of priorities and advise the MCZ on a future course, an *ad hoc* committee of noted mammalogists, chaired by Dr. Sidney Anderson of the American Museum of Natural History, was convened last Spring. The report of this committee recommended the appointment of a "full time professional mammalogist to supervise the management and future directions of development and use of the collection." The report also strongly affirms the value of the MCZ's mammal collection and recommends its being kept intact. Specific suggestions to move the dermestid colony elsewhere, the Concord Field Station being an obvious choice, are contained in the appendix.

At the first meeting of the MCZ Scientific Staff this fall it was agreed to appoint a full time professional mammalogist as an Assistant or Associate Professor. Dr. Wilson spelled out his view (which is shared by some of the staff) of the criteria for an ideal curator/professor, namely:

1. The person have a major concern with the collection and be committed to making it larger, stronger, and more accessible to other scientists.

2. The person be a leading researcher, preferably in the curatorial area or group but not necessarily classification. The person could also be working on some biological aspect of one species.

3. The person have a deep interest and knowledge of the natural history of the group and promote scientific interest in it among colleagues and students.

At their meeting of October 21, the Committee of Professors in Organismic and Evolutionary Biology voted to appoint a search committee to fill the new position in Mammalogy.

That the area of systematics, including both academic appointments and care of the collections, is receiving a great deal of attention at the MCZ in 1977 is certainly warranted. As Dr. Wilson concludes in an enlightening article "Recent Advances in Systematics (BioScience, Vol. 18, No. 12, 1968):

> "Systematics, pure systematics, the substantive part of day-to-day taxonomy . . . is an extraordinarily polyglot and viable science at the present time. It's proprietary goals . . . are among the most interesting and difficult in modern science, and they should occupy us, the best minds we can attract to join us, and our successors for many years to come."

ADMISSION CHARGE INSTITUTED

In order to meet the increasing costs of maintaining a public exhibition area, the Harvard University Museum (including the MCZ, Peabody Museum, Geological and Mineralogical Museum, and the Botanical Museum) started charging a modest admission fee ($1.00 for adults and $.50 for children 15 and under) in November. There is no additional charge for the Glass Flowers (formerly $.50). Friends of the MCZ, members of the Peabody Museum Association, members of the Harvard community, and Boston and Cambridge schoolchildren in organized groups are admitted free of charge by showing identification cards. Friday is a free day for everyone.

Closer collaboration between the four museums on matters affecting the public has been developing over the last few months. The two new directors (Professor C. C. Lamberg-Karlovsky of the Peabody and Professor Raymond Siever of the Geological and Mineralogical Museum) are joining forces with Professor Richard E. Schultes (Botanical Museum) and Professor A. W. Crompton to provide more services to the museum visitor.

Dr. Lance Lanyon surrounded by son, Richard, wife, Mary (who is also a veterinarian at Bristol), and the cooperative sheep, appears to be in an ideal setting for a year of research at the Concord Field Station. The Lanyon family, which also includes a three-month old girl, is living at the Field Station apartment.

DR. LANCE LANYON VISITS THE MCZ

"O! That this too too solid flesh would melt/Thaw and resolve itself into a dew" prayed the depressed Hamlet knowing that someday, probably too far in the future to suit his present condition, his flesh would indeed "melt". But what of his bones? Would they continue their seemingly lifeless existence throughout eternity? Or, as put by Dr. Lance Lanyon, Lecturer at the University of Bristol, who is a Visiting Associate this year at the MCZ, in his chapter on bone for an undergraduate textbook:

> "The rigid supportive nature of the skeleton, and its apparent structural permanence, both during life and after death, often gives an impression of inertness and inactivity which would be better associated with inanimate structures such as buildings or bridges. Contrary to this initial impression, it is well known that bone is a metabolically important tissue which actively contributes to the mineral homeostasis of the body."

In fact, far from being lifeless, ten percent of the bone in a normal person's (or animal's) body is replaced each year.

Dr. Lanyon, a veterinarian by training ("At Bristol all the medicines including veterinary and dental are taught together" he explains) has been interested in the strain to which bones are subjected in the course of their normal functioning. That bones adapt to the amount of activity to which they are subjected, i.e., that athletes would produce more bone than sedentary scholars, is another superficially unexpected fact. Dr. Lanyon has developed a way of measuring precise amounts of bone strain by adapting a device called a strain gauge, originally used in the airplane industry. Consisting of a small grid of wires leading to an amplifier, this device has enabled Dr. Lanyon to measure strain in living animals. He has even inserted one into a willing human subject (and colleague). However, the most convenient research animal for this purpose is a sheep.

At the Concord Field Station, Dr. Lanyon is using sheep to measure the exact effects of hip replacement on the surrounding bone. This type of surgery has become far more widely practiced now that people, particularly elderly women, are literally outliving their bones. Why bone production slacks off in post-menopausal women is not yet fully understood. Obviously, hormones play a role but this is only part of the story. One of Dr. Lanyon's long-term research projects is to find out the rest.

NEW MUSEUM EDUCATION COORDINATOR

Elizabeth Cori-Jones has been appointed to coordinate the MCZ's education programs at three Boston schools this year. Peter Walsh, last year's co-ordinator and author of ten successful education grant proposals, is now in charge of exhibits. Funded by the State, these "Magnet" programs are providing a greatly enriched natural science curriculum for the Trotter, Ohrenburger and Guild Schools. Museum teachers David Ebert and Lula Christopher are currently establishing a science center at the Trotter School in Roxbury while Penny Perel and Margaret Balaconis are working on an extension of last year's mini-museum with students at the Guild School.

Aside from keeping these programs running smoothly, Ms. Cori-Jones is also teaching in the program herself and grappling with the never-ending problem of future funding. Until the Cultural Education Act provides sufficient funds to back up the State's firm commitment to linking cultural institutions with schools, these highly acclaimed programs face an uncertain future.

Ms. Cori-Jones' background has equipped her well for her challenging task. She has developed science curricula for Portland, Maine school children; has lived on a Maine farm where survival got down to basics; and recently worked on educational television programming, also in Maine. She is a member of the founding board of the Aquarium of the Gulf of Maine.

TURID HOLLODOBLER SHOWS HER WORK

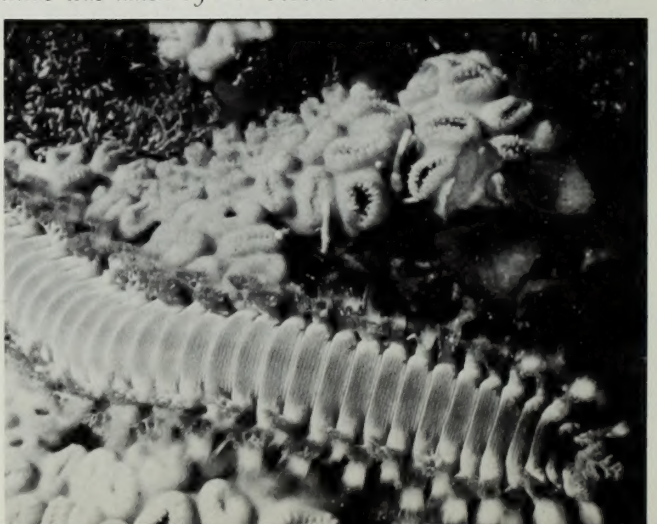
"Turid Hollodobler: Her Art and Her Scientific Illustration" was the title of the exhibition at the Wellesley College Art Department from October 21 to November 5. The exhibition and accompanying lectures by the artist were designed to introduce students to the possibilities in the field of scientific illustration. Mrs. Holldobler, who is best known for her exquisite ant drawings and paintings which illustrate husband Professor Bert Holldobler's research, also displayed some of her purely artistic work.

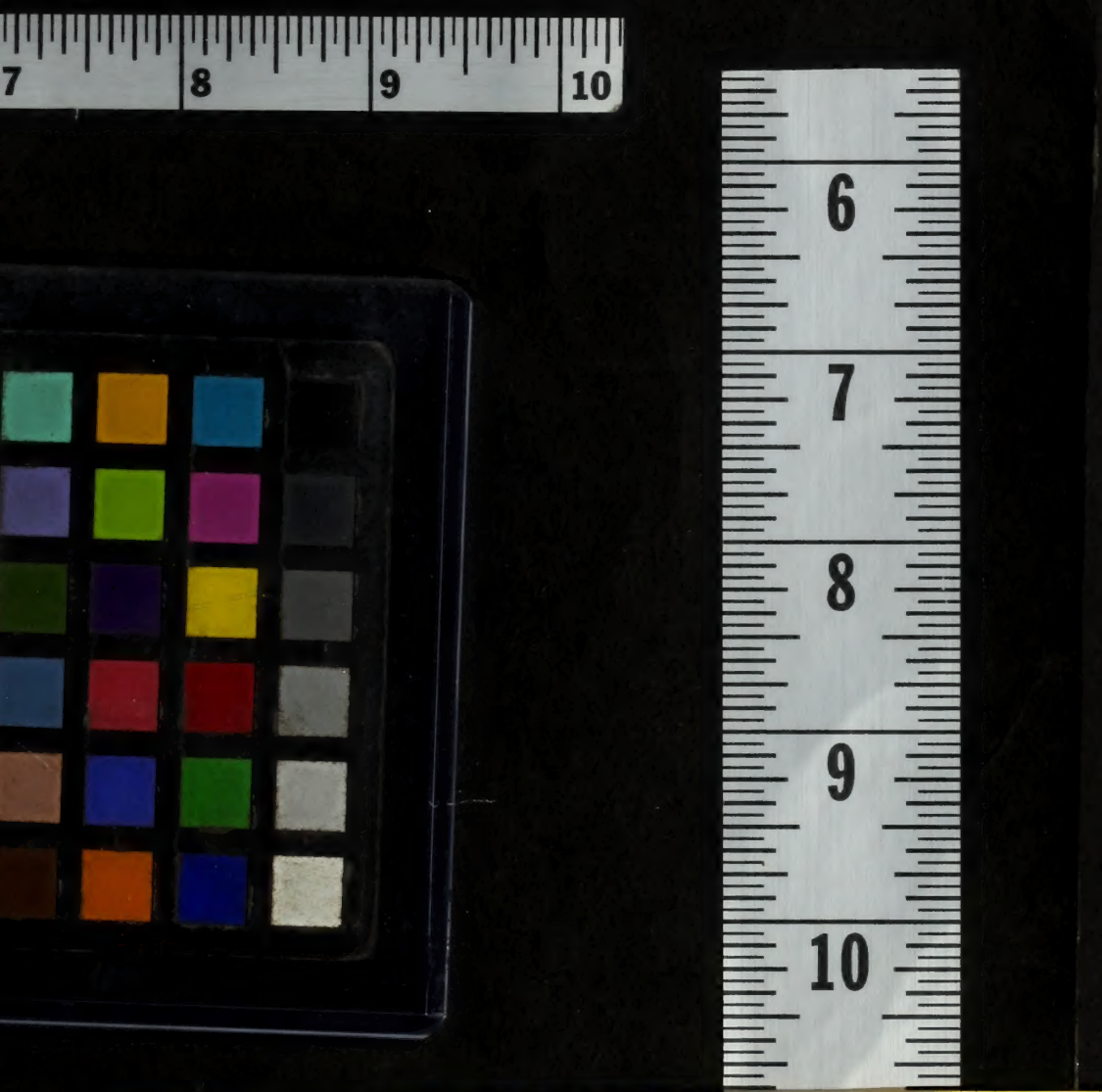
MARINE ECOLOGIST JOINS THE STAFF

Dr. Kenneth P. Sebens, who received his Ph.D. degree from the University of Washington (Seattle), has been appointed Assistant Professor of Biology to fill the vacancy left by Dr. Jane L. Menge, who left in June. Dr. Sebens will teach in Biology 154: Population and Community Ecology and also holds discussion meetings on community ecology.

Dr. Sebens studies the ecology of attached ocean-floor animals including anemones, corals, and zoanthids. He is interested in their population dynamics, energetics of growth, and control of sexual and asexual reproduction. He is currently engaged in three research projects: the causes of the distribution pattern in reef flat zoanthids in the San Blas Islands (Panama); the ecology and systematics of sea anemones of the Chilean coast; and the structure of the subtidal rock wall communities on the northern Massachusetts and Maine coasts.

This underwater photograph of a fireworm feeding on zoanthids was taken by Dr. Sebens in the San Blas Islands.





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